



12-22-06

PATENT

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
(Case No. 05-720-US2)

In re Application of:

John Kouvetakis

Serial No.: 10/559,981

Filing Date: December 8, 2005

For: GESN Alloys and Ordered Phases with  
Direct Tunable Bandgaps Grown Directly on  
Silicon

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) Group Art Unit: 2812  
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) Examiner: To be assigned  
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) Confirmation No.: 6588  
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**TRANSMITTAL LETTER**

Commissioner for Patents  
PO Box 1450  
Alexandria, VA 22313-1450

Dear Sir/Madam:

In regard to the above-identified U.S. patent application;

1. We are transmitting herewith the attached:

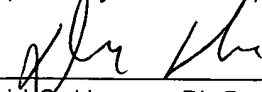
- ☒ Transmittal Letter (1 sheet)
- ☒ Information Disclosure Statement (IDS) (11 sheets);
- ☒ IDS Form 1449 (13 sheets);
- ☒ 123 Cited References (Copies of references 13-123 are enclosed herewith);
- ☒ Return Receipt Postcard.

1. With respect to fees:

- a) No fee is required.
- b) Please charge any underpayment or credit any overpayment our Deposit Account, No. 13-2490.

2. CERTIFICATE OF MAILING BY "EXPRESS MAIL" UNDER 37 CFR § 1.10: The undersigned hereby certifies that this Transmittal Letter and the papers, as described hereinabove, are being deposited with the United States Postal Service with sufficient postage as "Express Mail Post Office to Addressee" in a box addressed to: P.O. Box 1450, Alexandria, VA 22313-1450, on this 20<sup>th</sup> day of December, 2006. Express Mail No. **EV840507821US**.

Respectfully submitted,

  
\_\_\_\_\_  
David S. Harper, Ph.D.  
Registration No. 42,636



PATENT

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Examiner: To be assigned

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INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

Pursuant to 37 C.F.R. Section 1.97 - 1.99, the Applicant wishes to make the following references of record in the above-identified application. This Information Disclosure Statement is in compliance with the continuing duty of candor as set forth in 37 C.F.R. Section 1.56. Copies of the references cited below are enclosed. These references are also listed on the enclosed PTO Form 1449.

In the judgment of the undersigned, portions of the listed references may be material to the Examiner's consideration of the presently pending claims. However, the references have not been reviewed in sufficient detail to make any other representation and, in particular, no representation is intended as to the relative relevance between references, whether cited in this or prior statements. This statement is not a representation that the listed references have effective dates early enough to be "prior art" within the meaning of 35 U.S.C. Section 102 or Section 103.

This Information Disclosure Statement is being filed:

- ☒ within three months of the filing date of a national application; within three months of the date of entry into the national stage as set forth in 37 C.F.R. § 1.491 in an international application; or before the mailing date of a first Office Action on the merits. 37 C.F.R. §1.97 (b)
- ☐ **after** three months of the filing date of a national application, or the date of entry into the national stage as set forth in 37 C.F.R. § 1.491 in an international application; or **after** the mailing date of a first Office Action on the merits, but **before** the mailing date of a Final Action under 37 C.F.R. § 1.113 or a Notice of Allowance under 37 C.F.R. § 1.311 (whichever occurs first), and includes (37 C.F.R. § 1.97 (c):
- ☐ the Certification under 37 C.F.R. § 1.97(e) (see “Certification” below)

**OR**

- ☐ the fee of \$180.00 set forth in 37 C.F.R. § 1.17(p) (see “Fees” below).
- ☐ **after** a Final Action under 37 C.F.R. § 1.113 or a Notice of Allowance under 37 C.F.R. § 1.311 (whichever occurs first), but before, or simultaneously with, the payment of the issue fee, and includes the Certification under 37 C.F.R. § 1.97(e) (see “Certification” below), and the Petition Fee set forth in 37 C.F.R. § 1.17(i) (see “Fees” and “Method of Payment of Fees” below). Applicants hereby petitions for consideration of the Information Disclosure Statement submitted herewith and the accompanying references in examination of the subject patent application.

#### CERTIFICATION

- ☐ The **undersigned** hereby certifies that each item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign patent application not more than three months prior to the filing of the Information Disclosure Statement.
- ☐ The **undersigned** hereby certifies that no item of information contained in the Information Disclosure Statement was cited in a communication from a foreign patent office in a counterpart foreign patent application or, to the knowledge of the person signing the certification after making reasonable inquiry, was known to any individual designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of the Information Disclosure Statement.

FEES

- ☒ No fee is owed by the applicant(s).  
☐ The **IDS Fee of \$180.00** under 37 C.F.R. § 1.17(p) is enclosed herewith.

METHOD OF PAYMENT OF FEES

- ☐ Attached is a check in the amount of \$180.00

**CERTIFICATE OF MAILING VIA EXPRESS MAIL DELIVERY under 37 C.F.R. § 1.10.** I hereby certify that the attached paper of fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" Service under 37 C.F.R. § 1.10 on the date indicated above and is addressed to Commissioner for Patents, Box 1450, Alexandria, VA, 22313-1450, on this 20<sup>th</sup> day of March, 2006. **Express Mail No. EV840507821US.**

Respectfully submitted,



David S. Harper  
Registration No. 42,636

United States Patents

1. Murthy, et al., U.S. Publication No. US 2003-0157787 A1, Published on August 21, 2003.
2. Kouvetakis, et al., U.S. Publication No. US 2006-0134895 A1, Published on June 22, 2006.
3. Kouvetakis, et al., U.S. Publication No. US 2006-0236923 A1, Published on October 26, 2006.
4. Kouvetakis, et al., U.S. Publication No. US 2006-0163612-A1, Published on July 27, 2006.
5. Kouvetakis, et al., U.S. Patent No. 6,911,084, Issued on June 28, 2005.
6. Sugawara, et al., U.S. Patent No. 5,532,183, Issued on July 2, 1996.
7. Tang, et al., U.S. Patent No. 5,198,387, Issued on March 30, 1993.
8. Oguro, U.S. Patent No.: 5,714,415, Issued on February 3, 1998.
9. Mani, U.S. Patent No.: 6,410,434, Issued on June 25, 2002.
10. Cordone, et al., U.S. Patent No.: 6,723,621 B1, Issued on April 20, 2004.
11. Soref, et al., U.S. Patent No.: 6,897,471, Issued on May 24, 2005.
12. Doppalapudi, et al., U.S. Patent No.: 6,441,716, Issued on August 27, 2002.

### **Foreign Documents**

13. PCT Patent Publication No. WO 2005/001902, published January 6, 2005.
14. PCT Patent Publication No. WO 2004/114368, published December 29, 2004.
15. PCT Patent Publication No. WO 2005/015609, published February 17, 2005.
16. PCT Patent Publication No. WO 2003/033781, published April 24, 2003.
17. PCT Patent Publication No. WO 2006/009171, published January 26, 2006.

### **Other Documents**

18. D. W. Jenkins, "Electronic properties of metastable  $\text{Ge}_x\text{Sn}_{1-x}$  alloys", Phys. Rev. B., Vol: 36, pp. 7994-8001 (1987).
19. K. A. Mader, "Band structure and instability of  $\text{Ge}_x\text{Sn}_{1-x}$  alloys", Solid State Commun., Vol: 69 (12), pp. 1123-1126 (1989).
20. G. He and H.A. Atwater, "Interband transitions in  $\text{Sn}_x\text{Ge}_{1-x}$  Alloys", Phys. Rev. Lett., Vol: 79(10), pp. 1937-1940 (1997).
21. O. Gurdal, R. Desjardins, J. R. A. Carlsson, N. Taylor, H. H. Radamson, J.-E. Sundgren, and J. E. Greene, "Low-temperature growth and critical epitaxial thicknesses of fully strained metastable  $\text{Ge}_{1-x}\text{Sn}_x$  ( $x \leq 0.26$ ) alloys", J. Appl. Phys., Vol: 83(1), pp. 162-170 (1998).
22. M. T. Asom, E. A. Fitzgerald, A. R. Kortan, B. Spear, and L. C. Kimerling, "Epitaxial Growth of  $\text{SnGe}$  Alloys", Appl. Phys. Lett., Vol: 55(6), pp. 578-580 (1989).
23. H. Höchst, M. A. Engelhardt, and D. W. Niles, "The MBE growth and electronic structure of  $\alpha$ - $\text{Sn}_x\text{Ge}_{1-x}$  alloys", SPIE Proceedings, Vol: 1106, pp. 165-171 (1989)(ABSTRACT).
24. C. A. Hoffman, et al., "Three-Band transport and cyclotron resonance in  $\alpha$ - $\text{Sn}$  and  $\alpha$ - $\text{Sn}_{1-x}\text{Ge}_x$  grown by molecular-beam epitaxy", Phys. Rev. B. Vol: 40(17): pp. 11693-11700, (1989).
25. W. Wegscheider, K. Eberl, U. Menzinger, and G. Abstreiter, "Single-crystal  $\text{Sn/Ge}$  superlattices on  $\text{Ge}$  substrates: Growth and structural properties", Appl. Phys. Lett., Vol: 57(9), pp. 875-877 (1990).
26. O. Gurdal, et al., "Growth of metastable  $\text{Ge}_{1-x}\text{Sn}_x/\text{Ge}$  strained layer superlattices on  $\text{Ge}(001)2 \times 1$  by temperature-modulated molecular beam epitaxy", Appl. Phys. Lett., Vol: 67(7), pp. 956-958 (1995).
27. P. R. Pukite, A. Harwit, and S. S. Iyer, "Molecular beam epitaxy of metastable, diamond structure  $\text{Sn}_x\text{Ge}_{1-x}$  alloys", Appl. Phys. Lett. 54(21), pp. 2142-2144 (1989).
28. M. Bauer, et al., "Ge-Sn semiconductors for band-gap and lattice engineering", Appl. Phys. Lett. 81(16), pp. 2992-2994 (2002).

29. L. Bellaiche, S.-H. Wei and Z. Zunger, "Localization and percolation in semiconductor alloys: GaAsN vs GaAsP", Phys. Rev. B 54, 17568-17576 (1996).
30. J. Taraci, J. Tolle, M. R. M. Cartney, J. Menendez, M. A. Santana, D. J. Smith, and J. Kouvetakis, "Simple chemical routes to diamond-cubic germanium-tin alloys", App. Phys. Lett. 78(23), pp. 3607-3609 (2001).
31. J. Taraci, S. Zollner, M. R. McCartney, J. Menéndez, M. A. Santana, D. J. Smith, A. Haaland, A. V. Tutukin, G. Gundersen, G. Wolf, and J. Kouvetakis, "Synthesis of silicon-based infrared semiconductors in the Ge-Sn system using molecular chemistry methods", J. of the Am. Chem. Soc., Vol: 123(44), pp. 10980-10987 (2001).
32. V. Atluri, N. Herbots, D. Dagel, H. Jacobsson, M. Johnson, R. Carpio, and B. Fowler, "Comparison and reproducibility of H-passivation of Si(1000) with HF in methanol, ethanol, isopropanol and water by IBA, TMAFM, and FTIR", Mater. Res. Soc. Symp. Proc. 477, pp. 281-292 (1997) (ABSTRACT).
33. Z. Charafi and N. Bouarissa, "The effect of the violation of Vegard's law on the optical bowing in  $\text{Si}_{1-x}\text{Ge}_x$  alloys", Phys. Lett. A. Vol: 234, pp. 493-497 (1997).
34. H. Kajiyama, S.-I. Muramatsu, T. Shimada, and Y. Nishino, "Bond-length relaxation in crystalline  $\text{Si}_{1-x}\text{Ge}_x$  alloys: An extended x-ray-absorption fine-structure study", Phys. Rev. B Vol: 45(24), pp. 14005-14010 (1992).
35. F. Cerdeira, W. Dreyrodt, and M. Cardona, "Resonant raman scattering in germanium", Solid State Commun., Vol: 10, 591-595 (1972).
36. M.M. McGibbon, N.D. Browning, M.F. Chisholm, A.J. McGibbon, S.J. Pennycook, V. Ravikumar, V.P. Dravid, "Direct determination of grain boundary atomic structure in  $\text{SrTiO}_3$ ", Science, Vol: 266, pp. 102-104 (1994).
37. P. Mock, T. Topuria, N. D. Browning, G. R. Booker, N. J. Mason, R. J. Nicholas, M. Dobrowolska, S. Lee, and J. K. Furdyna, "Internal self-ordering in  $\text{In}(\text{Sb,As})$ ,  $\text{(In,Ga)Sb}$ , and  $\text{(Cd,Zn,Mn)Se}$  nano-agglomerates/quantum dots", Appl. Phys. Lett., Vol: 79(7), pp. 946-948. (2001).
38. D.M. Ceperley, B.J. Alder, "Ground State of the Electron Gas by Stochastic Method", Phys. Rev. Lett., Vol: 45, pp. 566-569 (1980).
39. T G. Kresse and J. Hafner, "Ab initio molecular dynamics for liquid metals", Phys. Rev. B47(1), pp. R558-561 (1993).
40. G. Kresse and J. Hafner, "Ab initio molecular-dynamics simulation of the liquid-metal-amorphous-semiconductor transition in germanium", Phys. Rev. B49(20), pp. 14251-14269 (1994).
41. G. Kresse, J. Furthmuller, "Efficiency of ab-initio total energy calculations for metals and semiconductors using a plane-wave basis set", Comput. Mater. Sci. Vol: 6, pp. 15-50 (1996).
42. G. Kresse, J. Furthmuller, "Efficient iterative schemes for ab initio total-energy calculations using a plane-wave basis set", Phys. Rev. B54(16), pp. 11169-11186 (1996).

43. R. A. Soref and L. Friedman, "Direct-gap Ge/GeSn/Si and GeSn/Ge/Si heterostructures", *Superlattices and Microstructures*, Vol: 14(2), 189-193 (1993).
44. M. R. Bauer, J. Kouvetakis, D.J. Smith and J. Menendez, "Tunable band structure in diamond cubic tin germanium alloys grown on Si", *Solid State Commun.*, Vol: 127, 355-359 (2003).
45. M.R. Bauer, P. Crozier, A.V.G Chizmeshya and J. D. Smith and J. Kouvetakis, "GeSn superstructured materials for Si-based optoelectronics", *Appl. Phys. Lett.* Vol: 83, pp. 3489-3491 (2003).
46. M. Bauer et al., "Tunable band structure in diamond-cubic tin-germanium alloys grown on silicon substrates", *Solid State Communications*, Vol: 127 (2003), pp. 355-359.
47. S. Cradock, E. A. V. Ebsorth, G. Davidson, L. A. Woodard, "Studies in Germyl Chemistry.3. Trigermylphosphine", *J. Chem. Soc. A*, 8, pp. 1229-1233 (1967).
48. D. W. H. Rankin, A. G. E. Robiet, G. M. Sheldrick, 5 Beagley, T. G. Hewit, "An electron Diffraction of the Molecular Structures of Trigermylphosphine and Trisilylstibine in the Gas Phase" *J. Inorg. Nucl. Chem.*, 31, pp. 2351-2357 (1969).
49. E. A. V. Ebsworth, D. J. Hutchison, D. W. H. Rankin, "The Preparation, properties, and Gas-Phase Molecular-Structure of 1,1- Difluoro-2,2-Digermylbiphosphone", *J. Chem. Res., Synop*, 12, pp. 393, (1980).
50. E. A. V. Ebsworth, D. W. H. Rankin, G. M. Sheldrick, "Preparation and Properties of Trigermyl-arsine and -stibine", *J. Chem. Soc. A*, 11, pp. 2828-2830 (1968).
51. D. E. Wingelet, A. D. Norman, "Redistribution of primary silyl-and germylphosphines; synthesis of trisilyl-and trigermylphosphines", *Phosphorus Sulfur*, 39(1-2), pp. 123-129, (1988).
52. G. A. Forsyth, D. W. H. Rankin, H. E. Robertson, "Determination of the molecular structure of Tris (Trimethylsilyl) phosphine in the gas phase by electron diffraction, supported by molecular mechanics calculations", *J. Mol. Struct.*, Vol: 239, pp. 209-217, (1990).
53. H. Schumann, H. J. Kroth, "NMR-Untersuchungen an Organoelementen(IVb)-Phosphinen, 2. Substituenteneinflüsse auf die P-chemischen Verschiebungen von Trimethylelement (IVb)-phosphinen", *Z. Naturforsch., B: Anorg. Chem., Chem.* 32B, pp. 513-515, (1977).
54. G. Becker, H. Freudenblum, O. Mundt, M. Reti, M. Sachs, *Synthetic Methods of Organometallic and Inorganic Chemistry*, 3, pp. 193-198 (1996).
55. S. Schulz, M. Nieger, "Synthesis and characterization of organogallium-antimony compounds", *J. of Organomet. Chem.*, Vol: 570, pp. 275-278 (1998).
56. H. Schumann, U. Frank, W. W. Du Mont, F. Marschner, "Organometallarsine", *J. Organomet. Chem.*, Vol: 222, pp. 217-225 (1981).
57. M. Ates, H. J. Breunig, M. Denker, "Formation of  $(\text{Me}_3\text{M})_3\text{Sb}$  ( $\text{M} = \text{Ge}, \text{Sn}, \text{Pb}$ ) and  $(\text{Me}_3\text{M})_4\text{Sb}_2$  ( $\text{M} = \text{Pb}$ ) by reaction of  $(\text{Me}_3\text{Si})_3\text{Sb}$  with  $\text{Me}_3\text{MCl}$ ", *Phosphorus, Sulfur Silicon Relate. Elem.*, Vol: 102, pp. 287-289 (1995).

58. H. Schumann, A. Roth, O. Stelzer, M. Schmidt, "Pyramidenformige Molekule Mit Dem Atomskelett", *Inorg. Nucl. Chem. Lett.* 2, pp. 311-312, (1986).
59. G. Davidson, L. A. Woodward, E. A. V. Ebsworth, G. M. Sheldrick, "The vibrational spectra and structure of trisilylarsine and trisilylstibine", *Spectrochim. Acta, Part A*, Vol: 23, pp. 2609-2616, (1967).
60. B. Beagley, A. G. Robiette, G. M. Sheldrick, "The Molecular Structures of  $(\text{SiH}_3)_3\text{P}$  and  $(\text{SiH}_3)_3\text{As}$ ", *Chem. Commun.* 12, pp. 601-602 (1967).
61. Blake, E. A. V. Ebsworth, S. G. D. Henderson, "Structure of trisilylphosphine,  $\text{P}(\text{SiH}_3)_x$ , at 100 K", *Acta Crystallogr., Sect. C: Cryst. Struct. Commun*, C47, pp. 486-489, (1991).
62. H. Siebert, J. Eints, "Neuvermessung des schwingungsspektrums von trisilylphosphin", *J. Mol. Struct.* Vol: 4, pp. 23-28, (1969).
63. D. C. McKean, "On the spectroscopic evidence for geometry in  $(\text{SiH}_3)_3\text{P}$  and  $(\text{SiH}_3)_3\text{As}$ ", *Spectrochim. Acta, Part A*, Vol: 24A, pp. 1253-1254 (1968).
64. J. E. Drake, J. Simpson, "Reactions of Monosilylarsine with Some Boron Lewis Acids and the Reaction of Monosilylphosphine with Boron Tribromide", *J. Chem. Soc. A*, 5, pp. 1039-1043 (1968).
65. E. H. Parker and T. E. Whall, "SiGe heterostructure CMOS circuits and applications", *Solid State Electronics* 43(8), pp. 1497-1506 (1999).
66. R. A. Soref and C. H. Perry, "Predicted band gap of the new semiconductor SiGeSn", *J. Appl. Phys.* 69, pp. 539-541 (1991).
67. K. A. Johnson and N. W. Ashcroft, "Electronic structure of ordered silicon alloys: Direct-gap systems", *Phys. Rev. B* 54, pp. 14480-14486 (1996).
68. R. Kost, in *Infrared-Applications-of-Semiconductors-II. Symposium*, (Mater. Res. Soc., 1998). pp. 3-10 (ABSTRACT).
69. W. Bett, F. Dimroth, G. Stollwerck, and O. V. Sulima, "III-V compounds for solar cell applications", *Appl. Phys. A: materials Science & Processing*, Vol: 69(2), pp. 119-129 (1999).
70. R. Gaska, A. Zukauskas, M. S. Shur, and M. A. Khan, "Progress in III-nitride based white light sources", *Proceedings of the SPIE*, Vol: 4776, pp. 82-96 (2002).
71. R. Bauer, C. Ritter, P. Crozier, J. Menendez, J. Ren, and J. Kouvetakis, "Synthesis of ternary Si-Ge-Sn semiconductors on Si(100) via  $\text{Sn}_x\text{Ge}_{1-x}$  buffer layers", *Appl. Phys. Lett.* 83 (11), 2163-2165 (2003).
72. H.K. Shin, D.J. Lockwood, J.-M. Baribeau, "Strain in coherent-wave SiGe/Si superlattices", *Solid State Commun.*, Vol: 114(10), pp. 505-510 (2000).
73. M. Meléndez-Lira, J. D. Lorentzen, J. Menéndez, W. Windl, N. Cave, R. Liu, J. W. Christiansen, N. D. Theodore, and J. J. Candelaria, "Microscopic carbon distribution in  $\text{Si}_{1-y}\text{C}_y$  alloys: A Raman scattering study", *Phys. Rev. B* 56, pp. 3648-3650 (1997).



74. C.S. Cook, S. Zollner, M.R. Bauer, P. Aella, J. Kouvetakis, and J. Menendez, "Optical constants and interband transitions of  $\text{Ge}_{1-x}\text{Sn}_x$  alloys ( $x < 0.2$ ) grown on Si by UHV-CVD", *Thin Solid Films* 455-456, pp. 217-221 (2004).
75. Chizmeshya, et al., "Experimental and Theoretical study of deviations from Vegards Law in the  $\text{Ge}_{1-x}\text{Ge}_x$  system", *Chem. Of Matls.*, Vol: 15, pp. 2511-2519 (2003).
76. Aella, et al., "Structural and optical properties of  $\text{Sn}_x\text{Si}_y\text{Ge}_{1-x-y}$  alloys", *App. Phys. Lett.* Vol: 84, pp. 888-890 (2004).
77. Roucka, et al., "Versatile buffer layer architectures based on  $\text{Ge}_{1-x}\text{Sn}_x$  alloys", *Appl. Phys. Lett.* Vol: 86(19), pp. 191912-191914 (2005).
78. He, et al., "Synthesis of expitaxial  $\text{Sn}_x\text{Ge}_{1-x}$  alloy films by ion-assisted molecular beam epitaxy", *App. Phys. Lett.*, Vol: 68(5), pp. 664-666 (1996).
79. Pristovsek, et al., "Growth of strained  $\text{GaAsSb}$  layers on  $\text{GaAs}$  (001) by MOVPE", *Journal of Crystal Growth*, Vol: 276, pp. 347-353 (2005).
80. Wosinski, et al., "Deep levels caused by misfit dislocations in  $\text{GaAsSb}/\text{GaAs}$  heterostructures", *Appl. Phys. Lett.*, Vol: 67(8), pp. 1131-1133.
81. Dvorak, et al., "300 GHz  $\text{InP}/\text{GaAsSb}/\text{InP}$  double HBTs with high current capability and  $\text{BVCEO} < 6\text{V}$ ", *IEEE Electron Device Letters*, Vol: 22(8), pp. 361-363 (2001).
82. Ryu Sang-Wan, et al., "Optical characterization and determination of conduction band offset of type-II  $\text{GaAsSb}/\text{InGaAs}$  QW", *Semiconductor Science and Technology*, Vol: 19, pp. 1369-1372 (2004).
83. Dowd, et al., "Long wavelength  $\text{GaAsP}/\text{GaAs}/\text{GaAsSb}$  VCSELs on  $\text{GaAs}$  substrates for communication applications", *Electronics Letters*, Vol: 39(13), pp. 987-988 (2003).
84. Zheng, et al., "Demonstration of High-Speed staggered lineup  $\text{GaAsSb}-\text{InP}$  Unitraveling Carrier Photodiodes", *IEEE Photonics Technology Letters*, Vol: 17(3), pp. 651-653 (2005).
85. Sun, et al., " $\text{GaAsSb}$ : a novel material for near infrared photodetectors on  $\text{GaAs}$  substrates", *Selected Topics in Quantum Electronics, IEEE Journal*, Vol: 8(4), pp. 817-822 (2002).
86. Kaniewski J., et al., "Resonant cavity enhanced  $\text{InGaAs}$  photodiodes for high speed detection of  $1.55\ \mu\text{m}$  infrared radiation", *Proceedings of SPIE-The International Society for Optical Engineering* (2005), Vol: 5783 (Pt. 1, Infrared Technology and Applications XXXI), pp. 47-56.
87. Kang, Y., et al., " $\text{InGaAs}$ -on-Si single photon avalanche photodetectors", *Applied Physics Letters* (2004), 85(10), pp. 1668-1670.
88. Kim S., et al., "High Performance  $0.1\ \mu\text{m}$   $\text{GaAs}$  Pseudomorphic High Electron Mobility Transistors with Si Pulse-Doped Cap Layer for 77GHz Car Radar Applications", *Jpn. J. App. Phys.* **44**, pp. 2472-2475 (2005).
89. Cristea P., et al., "Growth of  $\text{AlAsSb}/\text{InGaAs}$  MBE-layers for all-optical switches", *J. Cryst. Growth* **278**(1-4), pp. 544-547 (2005).

90. Li Y.J., et al., "Improved characteristics of metamorphic InAlAs/InGaAs high electron mobility transistor with symmetric graded  $\text{In}_x\text{Ga}_{1-x}\text{As}$  channel", J. of Vac. Sci. Tech. B **22**(5), pp. 2429-2433 (2004).
91. Mao R. W., et al., "Fabrication of 1.55  $\mu\text{m}$  Si-Based Resonant Cavity Enhanced Photodetectors Using Sol-Gel Bonding" IEEE Photonics Technology Letters **16**(8), pp. 1930-1932 (2004).
92. Pauchard A., et al., "Wafer-bonded InGaAs/silicon avalanche photodiodes", Proceedings of SPIE-The International Society for Optical Engineering, Vol: **4650** (Photodetector Materials and Devices VII), pp. 37-43 (2002).
93. Takano Y., et al., "Residual strain and threading dislocation density in InGaAs layers grown on Si substrates by metalorganic vapor-phase epitaxy", Appl. Phys. Lett., Vol: **78**(1), pp. 93-95 (2001).
94. Chriqui Y., et al., "Long wavelength room temperature laser operation of a strained InGaAs/GaAs quantum well structure monolithically grown by metalorganic chemical vapour deposition on a low energy-plasma enhanced chemical vapour deposition graded misoriented Ge/Si virtual substrate", Optical Materials, Vol: **27**, pp. 846-850 (2005).
95. V.K. Yang, et al., "Comparison of luminescent efficiency of InGaAs quantum well structures grown on Si, GaAs, Ge, and SiGe virtual substrate", J. Appl. Phys., Vol: **93**(9), pp. 5095-5102 (2003).
96. Shiu Fai Li, et al., "Scaling law for the compositional dependence of Raman frequencies in GeSi and SnGe alloys, Appl. Phys. Lett., Vol: **84**, pp. 867-869 (2004).
97. Cook, et al., "Optical constants and interband transitions of  $\text{Ge}_{1-x}\text{Sn}_x$  alloys ( $x < 0.2$ ) grown on Si", In press Thin Solid Films, Vol: **455-456**, pp. 217-221 (2004).
98. Menendez, et al., "Type-I  $\text{Ge}/\text{Ge}_{1-x-y}\text{Si}_x\text{Sn}_y$  strained-layer heterostructures with a direct Ge band gap, Appl. Phys. Lett., Vol: **85**(7), pp. 1175-1177 (2004).
99. Park, et al., "Observation of large stark shift in  $\text{Ge}_x\text{Si}_{1-x}/\text{Si}$  multiple quantum wells", J. Vac. Sci. Technol. B, Vol: **8**(2), pp. 217-220 (1990).
100. Baier, et al., "Type-II band alignment in  $\text{Si}/\text{Si}_{1-x}\text{Ge}_x$  quantum wells from photoluminescence line shifts due to optically induced band-bending effects: Experiment and theory", Phys. Rev. B, Vol: **50**(20), pp. 15191-15196 (1994).
101. Temkin, et al., " $\text{Ge}_x\text{Si}_{1-x}$  strained-layer superlattice waveguide photodetectors operating near 1.3  $\mu\text{m}$ ", Appl. Phys. Lett., Vol: **48**(15), pp. 963-965 (1986).
102. Li, et al., (2000), "Observation of quantum-confined stark shifts in SiGe/Si type-I multiple quantum wells", J. Appl. Phys. Vol: **87**(11), pp. 8195-8197.
103. Miyake, et al., "Absence of stark shift in strained  $\text{Si}_{1-x}\text{Ge}_x/\text{Si}$  type-I quantum wells", Appl. Phys. Lett., Vol: **68**(15), pp. 2097-2099 (1996).
104. O. Qasaimeh, et al., (1997), "Electroabsorption and Electrooptic Effect in SiGe-Si Quantum Wells: Realization of Low-Voltage Optical Modulators", IEEE J. Quantum Electron, Vol: **33**(9), pp. 1532-1536.

105. Jaros, "Simple analytic model for heterojunction band offsets", *Phys. Rev. B*. Vol: 37(12), pp. 7112-7114 (1988).
106. Tolle, et al., "Epitaxial growth of group III nitrides on Si substrates via a reflective lattice-matched zirconium diboride buffer layer", *Appl. Phys. Lett.*, Vol: 82(15), pp. 2398-2400 (2003).
107. Hu, et al., "Nucleation and growth of epitaxial  $\text{ZrB}_2(0001)$  on  $\text{Si}(111)$ ", *Journal of Crystal Growth*, Vol: 267, (2004) pp. 554-563.
108. Tolle, et al., "Epitaxial growth of  $\text{AlGaN}$  by metalorganic chemical vapor deposition on  $\text{Si}(111)$  via a  $\text{ZrB}_2(0001)$  buffer layer", *Appl. Phys. Lett.*, Vol: 84(18), pp. 3510-3512 (2004).
109. R.F.C. Farrow et al., "The growth of metastable, heteroepitaxial films of  $\alpha\text{-Sn}$  by metal beam epitaxy", *J. Cryst. Growth*, Vol: 54, pp. 507-518 (1981).
110. G Becker et al., "Notiz uber eine einfache methode zur darstellung von tris (trimethylsilyl)phosphin", *Chem. Ber.*, Vol: 108, pp. 2484-2485 (1975).
111. H. Schumann et al., "Trimethylsilyldiphosphane", *J. Organomet. Chem.*, Vol: 88, pp. C13-C16, (1975).
112. H. Schumann et al., "Eine einfache Methode zur Synthese von Organosilylphosphinen", *J. Organometallic Chem.* Vol: 55, pp. 257-260 (1973).
113. H. Burger et al., "Schwingungsspektren und Kraftkonstanten von Silyl-und Trimethylsilyl-Verbindungen von Elementen der 5. Gruppe", *Spectrochimica. Acta*, Vol: 26A, pp. 671-683, (1970).
114. H.J. Breunig et al., "Crystal structures of tris (trimethylsilyl) stibine and pentacarbonyl(tris(trimethylsilyl) stibine) chromium", *Journal of Organometallic Chemistry*, Vol: 608 (2000), pp. 60-62.
115. L. Rosch et al., "Darstellung und untersuchung von phosphinkomplexen mit aluminiumtrichlorid und aluminiumtriathyl", *Anorg. Allg. Chem*, Vol: 426, pp. 99-106 (1976).
116. H. Schumann et al., "Substituentenaustauschreaktionene zwischen Tris (Trimethylsilyl) phosphan und Trimethylgermanium- und Trimethylzinnchlorid", *Z. Naturforsch.*, Vol:29B, 608-610 (1974).
117. H. Schumann et al., "Darstellung und Schwingungsspektren von Trimethylsilyl-, Trimethylgermyl-und Trimethyl-stannyl-tert-butylphosphinen", *Chem. Ber.*, Vol: 107, pp. 854-869 (1974).
118. A.V.G. Engelhardt et al. *Naturforsch.*, "Uber die IR-, Raman-und  $^{31}\text{P}$ -NMR-Spektren ciniger phosphinderivate von germanium und zinn", *B: Anorg. Chem., Org. Chem., Biochem, Biophys., Biol.* Vol: 22b, pp. 352-353 (1967).
119. J.W. Anderson, J.E. Drake, "Trimethylstannylarsines", *Canadian Journal of Chemistry*, Vol: 49, pp. 2524-2528 (1971).
120. E. Niecke, H. Westermann, "A simple method for the preparation of Tris (trimethylsilyl) phosphine", *Synthesis*, (1988), page 330.

121. H.J. Breunig et al., Naturforsch., "Tetrakis (Trimethylsilyl) distiban", Z. Naturforsch., Vol: 34B, pp. 926-928 (1979).
122. H.J. Breunig, "Synthese von Tetrakis (trimethylgermyl)-Distibaiban", Z. Naturforsch., Vol: 33B, pp. 244-245, (1978).
123. Spanier, et al., "The Synthesis of Germysilane from Silane and German in a Silent Electric Discharge", Inorganic Chemistry, (1962), pp. 215-216.

Commonly owned Co-Pending Applications:

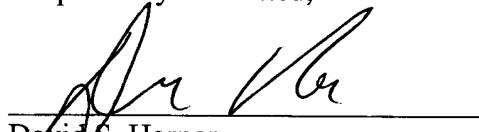
1. Kouvetakis, et al., U.S. Patent Application No. 10/559,980, Filed on December 8, 2005.
2. Kouvetakis, et al., U.S. Patent Application No. 10/559,979, Filed on December 8, 2005.

In accordance with MPEP Sections 609 and 707.05(b), it is requested the document cited (including any cited in applicant's specification which is not repeated on the attached Form PTO-1449) be given thorough consideration and that it be cited of record in the prosecution history of the present application by initialing on Form PTO-1449. Such initialing is requested even if the Examiner does not consider a cited document to be sufficiently pertinent to use in a rejection, or otherwise does not consider it to be prior art for any reason, or even if the Examiner does not believe that the guidelines for citation have been fully complied with. This is requested so that each document becomes listed on the face of the patent issuing on the present application.

Respectfully submitted,

Date: 12/20/06

By:



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05-720-US2

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Applicant:

Kouvetakis, et al.

Filing Date:

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U.S. PATENT DOCUMENTS

Examiner Initial		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
	1.	US 2003-0157787 A1	August 21, 2003	Murthy, et al.			
	2.	US 2006-0134895 A1	June 22, 2006	Kouvetakis, et al.			
	3.	US 2006-0236923 A1	October 26, 2006	Kouvetakis, et al.			
	4.	US 2006-0163612-A1	July 27, 2006	Kouvetakis, et al.			
	5.	6,911,084	June 28, 2005	Kouvetakis, et al.			
	6.	5,532,183	July 2, 1996	Sugawara, et al.			
	7.	5,198,387	March 30, 1993	Tang, et al.			
	8.	5,714,415	February 3, 1998	Oguro			
	9.	6,410,434	June 25, 2002	Mani			
	10.	6,723,621	April 20, 2004	Cordone, et al.			
	11.	6,897,471	May 24, 2005	Soref, et al.			
	12.	6,441,716	August 27, 2002	Doppalapudi, et al.			

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**FOREIGN PATENT DOCUMENTS**

Examiner Initial		Document Number	Date	Country	Class	Subclass	Translation	
							Yes	No
	13.	WO 2005/001902	January 6, 2005	PCT				
	14.	WO 2004/114368	December 29, 2004	PCT				
	15.	WO 2005/015609	February 17, 2005	PCT				
	16.	WO 2003/033781	April 24, 2003	PCT				
	17.	WO 2006/009171	January 26, 2006	PCT				

**OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc).**

Examiner Initial		
	18.	D. W. Jenkins, "Electronic properties of metastable GexSn1-x alloys", Phys. Rev. B., Vol: 36, pp. 7994-8001 (1987).
	19.	K. A. Mader, "Band structure and instability of GexSn1-x alloys", Solid State Commun., Vol: 69 (12), pp. 1123-1126 (1989).
	20.	G. He and H.A. Atwater, "Interband transitions in Sn <sub>x</sub> Ge <sub>1-x</sub> Alloys", Phys. Rev. Lett., Vol: 79(10), pp. 1937-1940 (1997).

EXAMINER

DATE CONSIDERED

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	<b>Filing Date:</b>  December 8, 2005	<b>Group:</b>  2812

21.	O. Gurdal, R. Desjardins, J. R. A. Carlsson, N. Taylor, H. H. Radamson, J.-E. Sundgren, and J. E. Greene, "Low-temperature growth and critical epitaxial thicknesses of fully strained metastable Ge <sub>1-x</sub> Sn <sub>x</sub> ( $x \leq 0.26$ ) alloys", J. Appl. Phys., Vol: 83(1), pp. 162-170 (1998).
22.	M. T. Asom, E. A. Fitzgerald, A. R. Kortan, B. Spear, and L. C. Kimerling, "Epitaxial Growth of SnGe Alloys", Appl. Phys. Lett., Vol: 55(6), pp. 578-580 (1989).
23.	H. Höchst, M. A. Engelhardt, and D. W. Niles, "The MBE growth and electronic structure of $\alpha$ -Sn <sub>x</sub> Ge <sub>1-x</sub> alloys", SPIE Proceedings, Vol: 1106, pp. 165-171 (1989)(ABSTRACT).
24.	C. A. Hoffman, et al., "Three-Band transport and cyclotron resonance in alpha -Sn and alpha -Sn <sub>1-x</sub> Ge <sub>x</sub> grown by molecular-beam epitaxy", Phys. Rev. B. Vol: 40(17): pp. 11693-11700, (1989).
25.	W. Wegscheider, K. Eberl, U. Menczgar, and G. Abstreiter, "Single-crystal Sn/Ge superlattices on Ge substrates: Growth and structural properties", Appl. Phys. Lett., Vol: 57(9), pp. 875-877 (1990).
26.	O. Gurdal, et al., "Growth of metastable Ge <sub>1-x</sub> Sn <sub>x</sub> /Ge strained layer superlattices on Ge(001)2x1 by temperature-modulated molecular beam epitaxy", Appl. Phys. Lett., Vol: 67(7), pp. 956-958 (1995).
27.	P. R. Pukite, A. Harwit, and S. S. Iyer, "Molecular beam epitaxy of metastable, diamond structure Sn <sub>x</sub> Ge <sub>1-x</sub> alloys", Appl. Phys. Lett. 54(21), pp. 2142-2144 (1989).
28.	M. Bauer, et al., "Ge-Sn semiconductors for band-gap and lattice engineering", Appl. Phys. Lett. 81(16), pp. 2992-2994 (2002).
29.	L. Bellaiche, S.-H. Wei and Z. Zunger, "Localization and percolation in semiconductor alloys: GaAsN vs GaAsP", Phys. Rev. B 54, 17568-17576 (1996).
30.	J. Taraci, J. Tolle, M. R. M. Cartney, J. Menendez, M. A. Santana, D. J. Smith, and J. Kouvetakis, "Simple chemical routes to diamond-cubic germanium-tin alloys", App. Phys. Lett. 78(23), pp. 3607-3609 (2001).

EXAMINER	DATE CONSIDERED
----------	-----------------

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31.	J. Taraci, S. Zollner, M. R. McCartney, J. Menéndez, M. A. Santana, D. J. Smith, A. Haaland, A. V. Tutukin, G. Gundersen, G. Wolf, and J. Kouvetakis, "Synthesis of silicon-based infrared semiconductors in the Ge-Sn system using molecular chemistry methods", J. of the Am. Chem. Soc., Col: 123(44), pp. 10980-10987 (2001).
32.	V. Atluri, N. Herbots, D. Dagel, H. Jacobsson, M. Johnson, R. Carpio, and B. Fowler, "Comparison and reproducibility of H-passivation of Si(1000) with HF in methanol, ethanol, isopropanol and water by IBA, TMAFM, and FTIR", Mater. Res. Soc. Symp. Proc. 477, pp. 281-292 (1997) (ABSTRACT).
33.	Z. Charafi and N. Bouarissa, "The effect of the violation of Vegard's law on the optical bowing in Si <sub>1-x</sub> Ge <sub>x</sub> alloys", Phys. Lett. A. Vol: 234, pp. 493-497 (1997).
34.	H. Kajiyama, S-I. Muramatsu, T. Shimada, and Y. Nishino, "Bond-length relaxation in crystalline Si <sub>1-x</sub> Ge <sub>x</sub> alloys: An extended x-ray-absorption fine-structure study", Phys. Rev. B Vol: 45(24), pp. 14005-14010 (1992).
35.	F. Cerdeira, W. Dreyrodt, and M. Cardona, "Resonant raman scattering in germanium", Solid State Commun., Vol: 10, 591-595 (1972).
36.	M.M. McGibbon, N.D. Browning, M.F. Chisholm, A.J. McGibbon, S.J. Pennycook, V. Ravikumar, V.P. Dravid, "Direct determination of grain boundary atomic structure in SrTiO <sub>3</sub> " Science, Vol: 266, pp. 102-104 (1994).
37.	P. Mock, T. Topuria, N. D. Browning, G. R. Booker, N. J. Mason, R. J. Nicholas, M. Dobrowolska, S. Lee, and J. K. Furdyna, "Internal self-ordering in In(Sb,As), (In,Ga) Sb, and (Cd,Zn,Mn) Se nano-agglomerates/quantum dots", Appl. Phys. Lett., Vol: 79(7), pp. 946-948. (2001).
38.	D.M. Ceperley, B.J. Alder, "Ground State of the Electron Gas by Stochastic Method", Phys. Rev. Lett., Vol: 45, pp. 566-569 (1980).

EXAMINER	DATE CONSIDERED
----------	-----------------

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(Use several sheets if necessary)			
		<b>Filing Date:</b> December 8, 2005	<b>Group:</b> 2812

39.	T G. Kresse and J. Hafner, "Ab initio molecular dynamics for liquid metals", Phys. Rev. B47(1), pp. R558-561 (1993).
40.	G. Kresse and J. Hafner, "Ab initio molecular-dynamics simulation of the liquid-metal-amorphous-semiconductor transition in germanium", Phys. Rev. B49(20), pp. 14251-14269 (1994).
41.	G. Kresse, J. Furthmuller, "Efficiency of ab-initio total energy calculations for metals and semiconductors using a plane-wave basis set", Comput. Mater. Sci. Vol: 6, pp. 15-50 (1996).
42.	G. Kresse, J. Furthmuller, "Efficient iterative schemes for ab initio total-energy calculations using a plane-wave basis set", Phys. Rev. B54(16), pp. 11169-11186 (1996).
43.	R. A. Soref and L. Friedman, "Direct-gap Ge/GeSn/Si and GeSn/Ge/Si heterostructures", Superlattices and Microstructures, Vol: 14(2), 189-193 (1993).
44.	M. R. Bauer, J. Kouvetakis, D.J. Smith and J. Menendez, "Tunable band structure in diamond cubic tin germanium alloys grown on Si", Solid State Commun., Vol: 127, 355-359 (2003).
45.	M.R. Bauer, P. Crozier, A.V.G Chizmeshya and J. D. Smith and J. Kouvetakis, "GeSn superstructured materials for Si-based optoelectronics", Appl. Phys. Lett. Vol: 83, pp. 3489-3491 (2003).
46.	M. Bauer et al., "Tunable band structure in diamond-cubic tin-germanium alloys grown on silicon substrates", Solid State Communications, Vol: 127 (2003), pp. 355-359.
47.	S. Craddock, E. A. V. Ebsorth, G. Davidson, L. A. Woodard, "Studies in Germyl Chemistry.3. Trigermylphosphine", J. Chem. Soc. A, 8, pp. 1229-1233 (1967).
48.	D. W. H. Rankin, A. G. E. Robiet, G. M. Sheldrick, S. Beagley, T. G. Hewit, "An electron Diffraction of the Molecular Structures of Trigermylphosphine and Trisilylstibine in the Gas Phase" J. Inorg. Nucl. Chem., 31, pp. 2351-2357 (1969).

EXAMINER	DATE CONSIDERED
----------	-----------------

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	<b>Filing Date:</b> December 8, 2005	<b>Group:</b> 2812

49.	E. A. V. Ebsworth, D. J. Hutchison, D. W. H. Rankin, "The Preparation, properties, and Gas-Phase Molecular-Structure of 1,1- Difluoro-2,2-Digermylbiphosphone", J. Chem. Res., Synop, 12, pp. 393, (1980).
50.	E. A. V. Ebsworth, D. W. H. Rankin, G. M. Sheldrick, "Preparation and Properties of Trigermyl-arsine and -stibine", J. Chem. Soc. A, 11, pp. 2828-2830 (1968).
51.	D. E. Wingeleth, A. D. Norman, "Redistribution of primary silyl-and germylphosphines; synthesis of trisilyl-and trigermylphosphines", Phosphorus Sulfur, 39(1-2), pp. 123-129, (1988).
52.	G. A. Forsyth, D. W. H. Rankin, H. E. Robertson, "Determination of the molecular structure of Tris (Trimethylsilyl) phosphine in the gas phase by electron diffraction, supported by molecular mechanics calculations", J. Mol. Struct., Vol: 239, pp. 209-217, (1990).
53.	H. Schumann, H. J. Kroth, "NMR-Untersuchungen an Organoelementen(IVb)-Phosphinen, 2. Substituenteneinflüsse auf die P-chemischen Verschiebungen von Trimethylelement (IVb)-phosphinen", Z. Naturforsch., B: Anorg. Chem., Chem. 32B, pp. 513-515, (1977).
54.	G. Becker, H. Freudenblum, O. Mundt, M. Reti, M. Sachs, Synthetic Methods of Organometallic and Inorganic Chemistry, 3, pp. 193-198 (1996).
55.	S. Schulz, M. Nieger, "Synthesis and characterization of organogallium-antimony compounds", J. of Organomet. Chem., Vol: 570, pp. 275-278 (1998).
56.	H. Schumann, U. Frank, W. W. Du Mont, F. Marschner, "Organometallarsine", J. Organomet. Chem, Vol: 222, pp. 217-225 (1981).
57.	M. Ates, H. J. Breunig, M. Denker, "Formation of (Me <sub>3</sub> M) <sub>3</sub> Sb (M = Ge, Sn, Pb) and (Me <sub>3</sub> M) <sub>4</sub> Sb <sub>2</sub> (M = Pb) by reaction of (Me <sub>3</sub> Si) <sub>3</sub> Sb with Me <sub>3</sub> MCl", Phosphorus, Sulfur Silicon Relate. Elem., Vol: 102, pp. 287-289 (1995).
58.	H. Schumann, A. Roth, O. Stelzer, M. Schmidt, "Pyramidenformige Moleküle Mit Dem Atomskelett", Inorg. Nucl. Chem. Lett. 2, pp. 311-312, (1986).

EXAMINER	DATE CONSIDERED
----------	-----------------

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59.	G. Davidson, L. A. Woodward, E. A. V. Ebsworth, G. M. Sheldrick, "The vibrational spectra and structure of trisilylarsine and trisilylstibine", <i>Spectrochim. Acta, Part A</i> , Vol: 23, pp. 2609-2616, (1967).
60.	B. Beagley, A. G. Robiette, G. M. Sheldrick, "The Molecular Structures of (SiH <sub>3</sub> ) <sub>3</sub> P and (SiH <sub>3</sub> ) <sub>3</sub> As", <i>Chem. Commun</i> , 12, pp. 601-602 (1967).
61.	A. Blake, E. A. V. Ebsworth, S. G. D. Henderson, "Structure of trisilylphosphine, P(SiH <sub>3</sub> ) <sub>3</sub> , at 100 K", <i>Acta Crystallogr., Sect. C: Cryst. Struct. Commun</i> , C47, pp. 486-489, (1991).
62.	H. Siebert, J. Eints, "Neuvermessung des schwingungsspektrums von trisilylphosphin", <i>J. Mol. Struct. Vol: 4</i> , pp. 23-28, (1969).
63.	D. C. McKean, "On the spectroscopic evidence for geometry in (SiH <sub>3</sub> ) <sub>3</sub> P and (SiH <sub>3</sub> ) <sub>3</sub> As", <i>Spectrochim. Acta, Part A</i> , Vol: 24A, pp. 1253-1254 (1968).
64.	J. E. Drake, J. Simpson, "Reactions of Monosilylarsine with Some Boron Lewis Acids and the Reaction of Monosilylphosphine with Boron Tribromide", <i>J. Chem. Soc. A</i> , 5, pp. 1039-1043 (1968).
65.	E. H. Parker and T. E. Whall, "SiGe heterostructure CMOS circuits and applications", <i>Solid State Electronics</i> 43(8), pp. 1497-1506 (1999).
66.	R. A. Soref and C. H. Perry, "Predicted band gap of the new semiconductor SiGeSn", <i>J. Appl. Phys.</i> 69, pp. 539-541 (1991).
67.	K. A. Johnson and N. W. Ashcroft, "Electronic structure of ordered silicon alloys: Direct-gap systems", <i>Phys. Rev. B</i> 54, pp. 14480-14486 (1996).
68.	A. R. Kost, in <i>Infrared-Applications-of-Semiconductors-II. Symposium</i> , (Mater. Res. Soc., 1998). pp. 3-10 (ABSTRACT).
69.	A. W. Bett, F. Dimroth, G. Stollwerck, and O. V. Sulima, "III-V compounds for solar cell applications", <i>Appl. Phys. A: materials Science &amp; Processing</i> , Vol: 69(2), pp. 119-129 (1999).

EXAMINER	DATE CONSIDERED
----------	-----------------

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		<b>Filing Date:</b>  December 8, 2005	<b>Group:</b>  2812

70.	R. Gaska, A. Zukauskas, M. S. Shur, and M. A. Khan, "Progress in III-nitride based white light sources", Proceedings of the SPIE, Vol: 4776, pp. 82-96 (2002).
71.	R. Bauer, C. Ritter, P. Crozier, J. Menendez, J. Ren, and J. Kouvetakis, "Synthesis of ternary Si-Ge-Sn semiconductors on Si(100) via $\text{Sn}_x\text{Ge}_{1-x}$ buffer layers", Appl. Phys. Lett. 83 (11), 2163-2165 (2003).
72.	H.K. Shin, D.J. Lockwood, J.-M. Baribeau, "Strain in coherent-wave SiGe/Si superlattices", Solid State Commun., Vol: 114(10), pp. 505-510 (2000).
73.	M. Meléndez-Lira, J. D. Lorentzen, J. Menéndez, W. Windl, N. Cave, R. Liu, J. W. Christiansen, N. D. Theodore, and J. J. Candelaria, "Microscopic carbon distribution in $\text{Si}_{1-y}\text{C}_y$ alloys: A Raman scattering study", Phys. Rev. B 56, pp. 3648-3650 (1997).
74.	C.S. Cook, S. Zollner, M.R. Bauer, P. Aella, J. Kouvetakis, and J. Menendez, "Optical constants and interband transitions of $\text{Ge}_{1-x}\text{Sn}_x$ alloys ( $x < 0.2$ ) grown on Si by UHV-CVD", Thin Solid Films 455-456, pp. 217-221 (2004).
75.	Chizmeshya, et al., "Experimental and Theoretical study of deviations from Vegards Law in the $\text{Ge}_{1-x}\text{Ge}_{1-x}$ system", Chem. Of Matls., Vol: 15, pp. 2511-2519 (2003).
76.	Aella, et al., "Structural and optical properties of $\text{Sn}_x\text{Si}_y\text{Ge}_{1-x-y}$ alloys", App. Phys. Lett. Vol: 84, pp. 888-890 (2004).
77.	Roucka, et al., "Versatile buffer layer architectures based on $\text{Ge}_{1-x}\text{Sn}_x$ alloys", Appl. Phys. Let. Vol: 86(19), pp. 191912-191914 (2005).
78.	He, et al., "Synthesis of expitaxial $\text{Sn}_x\text{Ge}_{1-x}$ alloy films by ion-assisted molecular beam epitaxy", App. Phys. Lett., Vol: 68(5), pp. 664-666 (1996). Pristovsek, et al., "Growth of strained gaAsSb layers on GaAs (001) by MOVPE", Journal of Crystal Growth, Vol: 276, pp. 347-353 (2005).
79.	Pristovsek, et al., "Growth of strained gaAsSb layers on GaAs (001) by MOVPE", Journal of Crystal Growth, Vol: 276, pp. 347-353 (2005).

EXAMINER	DATE CONSIDERED
----------	-----------------

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		<b>Filing Date:</b> December 8, 2005	<b>Group:</b> 2812

80.	Wosinski, et al., "Deep levels caused by misfit dislocations in GaAsSb/GaAs heterostructures", Appl. Phys. Lett., Vol: 67(8), pp. 1131-1133.
81.	Dvorak, et al., "300 GHz InP/GaAsSb/InP double HBTs with high current capability and BVCEO < 6V", IEEE Electron Device Letters, Vol: 22(8), pp. 361-363 (2001).
82.	Ryu Sang-Wan, et al., "Optical characterization and determination of conduction band offset of type-II GaAsSb/InGaAs QW", Semiconductor Science and Technology, Vol: 19, pp. 1369-1372 (2004).
83.	Dowd, et al., "Long wavelength GaAsP/GaAs/GaAsSb VCSELs on GaAs substrates for communication applications", Electronics Letters, Vol: 39(13), pp. 987-988 (2003).
84.	Zheng, et al., "Demonstration of High-Speed staggered lineup GaAsSb-InP Unitraveling Carrier Photodiodes", IEEE Photonics Technology Letters, Vol: 17(3), pp. 651-653 (2005).
85.	Sun, et al., "GaAsSb: a novel material for near infrared photodetectors on GaAs substrates", Selected Topics in Quantum Electronics, IEEE Journal, Vol: 8(4), pp. 817-822 (2002).
86.	Kaniewski J., et al., "Resonant cavity enhanced InGaAs photodiodes for high speed detection of 1.55 $\mu\text{m}$ infrared radiation", Proceedings of SPIE-The International Society for Optical Engineering (2005), Vol: 5783 (Pt. 1, Infrared Technology and Applications XXXI), pp. 47-56.
87.	Kang, Y., et al., "InGaAs-on-Si single photon avalanche photodetectors", Applied Physics Letters (2004), 85(10), pp. 1668-1670.
88.	Kim S., et al., "High Performance 0.1 $\mu\text{m}$ GaAs Pseudomorphic High Electron Mobility Transistors with Si Pulse-Doped Cap Layer for 77GHz Car Radar Applications", Jpn. J. App. Phys. <b>44</b> , pp. 2472-2475 (2005).
89.	Cristea P., et al., "Growth of AlAsSb/InGaAs MBE-layers for all-optical switches", J. Cryst. Growth <b>278</b> (1-4), pp. 544-547 (2005).
90.	Li Y.J., et al., "Improved characteristics of metamorphic InAlAs/InGaAs high electron mobility transistor with symmetric graded $\text{In}_x\text{Ga}_{1-x}\text{As}$ channel", J. of Vac. Sci. Tech. B <b>22</b> (5), pp. 2429-2433 (2004).

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-----------------	------------------------

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91.	Mao R. W., et al., "Fabrication of 1.55 $\mu\text{m}$ Si-Based Resonant Cavity Enhanced Photodetectors Using Sol-Gel Bonding" IEEE Photonics Technology Letters <b>16</b> (8), pp. 1930-1932 (2004).
92.	Pauchard A., et al., "Wafer-bonded InGaAs/silicon avalanche photodiodes", Proceedings of SPIE-The International Society for Optical Engineering, Vol: <b>4650</b> (Photodetector Materials and Devices VII), pp. 37-43 (2002).
93.	Takano Y., et al., "Residual strain and threading dislocation density in InGaAs layers grown on Si substrates by metalorganic vapor-phase epitaxy", Appl. Phys. Lett., Vol: <b>78</b> (1), pp. 93-95 (2001).
94.	Chriqui Y., et al., "Long wavelength room temperature laser operation of a strained InGaAs/GaAs quantum well structure monolithically grown by metalorganic chemical vapour deposition on a low energy-plasma enhanced chemical vapour deposition graded misoriented Ge/Si virtual substrate", Optical Materials, Vol: <b>27</b> , pp. 846-850 (2005).
95.	V.K. Yang, et al., "Comparison of luminescent efficiency of InGaAs quantum well structures grown on Si, GaAs, Ge, and SiGe virtual substrate", J. Appl. Phys., Vol: <b>93</b> (9), pp. 5095-5102 (2003).
96.	Shiu Fai Li, et al., "Scaling law for the compositional dependence of Raman frequencies in GeSi and SnGe alloys, Appl. Phys. Lett., Vol: 84, pp. 867-869 (2004).
97.	Cook, et al., "Optical constants and interband transitions of Ge <sub>1-x</sub> Sn <sub>x</sub> alloys (x<0.2) grown on Si", In press Thin Solid Films, Vol: 455-456, pp. 217-221 (2004).
98.	Menendez, et al., "Type-I Ge/Ge <sub>1-x-y</sub> Si <sub>x</sub> Sn <sub>y</sub> strained-layer heterostructures with a direct Ge band gap, Appl. Phys. Lett., Vol: 85(7), pp. 1175-1177 (2004).
99.	Park, et al., "Observation of large stark shift in Ge <sub>x</sub> Si <sub>1-x</sub> /Si multiple quantum wells", J. Vac. Sci. Technol. B, Vol: 8(2), pp. 217-220 (1990).
100.	Baier, et al., "Type-II band alignment in Si/Si <sub>1-x</sub> Ge <sub>x</sub> quantum wells from photoluminescence line shifts due to optically induced band-bending effects: Experiment and theory", Phys. Rev. B, Vol: 50(20), pp. 15191-15196 (1994).

EXAMINER	DATE CONSIDERED
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Kouvetakis, et al.

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**Group:**

2812

101.	Temkin, et al., "GexSi1-x strained-layer superlattice waveguide photodetectors operating near 1.3 $\mu$ m", Appl. Phys. Lett., Vol: 48(15), pp. 963-965 (1986).
102.	Li, et al., (2000), "Observation of quantum-confined stark shifts in SiGe/Si type-I multiple quantum wells", J. Appl. Phys. Vol: 87(11), pp. 8195-8197.
103.	Miyake, et al., "Absence of stark shift in strained Si1-xGex/Si type-I quantum wells", Appl. Phys. Lett., Vol: 68(15), pp. 2097-2099 (1996).
104.	O. Qasaimeh, et al., (1997), "Electroabsorption and Electrooptic Effect in SiGe-Si Quantum Wells: Realization of Low-Voltage Optical Modulators", IEEE J. Quantum Electron, Vol: 33 (99), pp. 1532-1536.
105.	Jaros, "Simple analytic model for heterojunction band offsets", Phys. Rev. B. Vol: 37(12), pp. 7112-7114 (1988).
106.	Tolle, et al., "Epitaxial growth of group III nitrides on Si substrates via a reflective lattice-matched zirconium diboride buffer layer", Appl. Phys. Lett., Vol: 82(15), pp. 2398-2400 (2003).
107.	Hu, et al., "Nucleation and growth of epitaxial ZrB <sub>2</sub> (0001) on Si(111)", Journal of Crystal Growth, Vol: 267, (2004) pp. 554-563.
108.	Tolle, et al., "Epitaxial growth of AlGaN by metalorganic chemical vapor deposition on Si(111) via a ZrB <sub>2</sub> (0001) buffer layer", Appl. Phys. Lett, Vol: 84(18), pp. 3510-3512 (2004).
109.	R.F.C. Farrow et al., "The growth of metastable, heteroepitaxial films of $\alpha$ -Sn by metal beam epitaxy", J. Cryst. Growth, Vol: 54, pp. 507-518 (1981).
110.	G Becker et al., "Notiz uber eine einfache methode zur darstellung von tris (trimethylsilyl)phosphin", Chem. Ber., Vol: 108, pp. 2484-2485 (1975).
111.	H. Schumann et al., "Trimethylsilyldiphosphane", J. Organomet. Chem., Vol: 88, pp. C13-C16, (1975).

EXAMINER

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Kouvetakis, et al.

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**Group:**

2812

112.	H. Schumann et al., "Eine einfache Methode zur Synthese von Organosilylphosphinen", J. Organometallic Chem. Vol: 55, pp. 257-260 (1973).
113.	H. Burger et al., "Schwingungsspektren und Kraftkonstanten von Silyl- und Trimethylsilyl-Verbindungen von Elementen der 5. Gruppe", Spectrochimica. Acta, Vol: 26A, pp. 671-683, (1970).
114.	H.J. Breunig et al., "Crystal structures of tris (trimethylsilyl) stibine and pentacarbonyl(tris(trimethylsilyl) stibine) chromium", Journal of Organometallic Chemistry, Vol: 608 (2000), pp. 60-62.
115.	L. Rosch et al., "Darstellung und untersuchung von phosphinkomplexen mit aluminiumtrichlorid und aluminiumtriathyl", Anorg. Allg. Chem, Vol: 426, pp. 99-106 (1976).
116.	H. Schumann et al., "Substituentenaustauschreaktionen zwischen Tris (Trimethylsilyl) phosphan und Trimethylgermanium- und Trimethylzinnchlorid", Z. Naturforsch., Vol: 29B, 608-610 (1974).
117.	H. Schumann et al., "Darstellung und Schwingungsspektren von Trimethylsilyl-, Trimethylgermyl- und Trimethylstannyl-tert-butylphosphinen", Chem. Ber., Vol: 107, pp. 854-869 (1974).
118.	A.V.G. Engelhardt et al. Naturforsch., "Über die IR-, Raman- und <sup>31</sup> P-NMR-Spektren einiger phosphinderivate von germanium und zinn", B: Anorg. Chem., Org. Chem., Biochem, Biophys., Biol. Vol: 22b, pp. 352-353 (1967).
119.	J.W. Anderson, J.E. Drake, "Trimethylstannylarsines", Canadian Journal of Chemistry, Vol: 49, pp. 2524-2528 (1971).
120.	E. Niecke, H. Westermann, "A simple method for the preparation of Tris (trimethylsilyl) phosphine", Synthesis, (1988), page 330.
121.	H.J. Breunig et al., Naturforsch., "Tetrakis (Trimethylsilyl) distiban", Z. Naturforsch., Vol: 34B, pp. 926-928 (1979).
122.	H.J. Breunig, "Synthese von Tetrakis (trimethylgermyl)-Distiban", Z. Naturforsch., Vol: 33B, pp. 244-245, (1978).
123.	Spanier, et al., "The Synthesis of Germysilane from Silane and German in a Silent Electric Discharge", Inorganic Chemistry, (1962), pp. 215-216

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**COMMONLY OWNED CO-PENDING APPLICATIONS**

<b>Examiner Initial</b>		
	1.	Kouvetakis, et al., U.S. Patent Application No. 10/559,980, Filed on December 8, 2005.
	2.	Kouvetakis, et al., U.S. Patent Application No. 10/559,979, Filed on December 8, 2005.

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